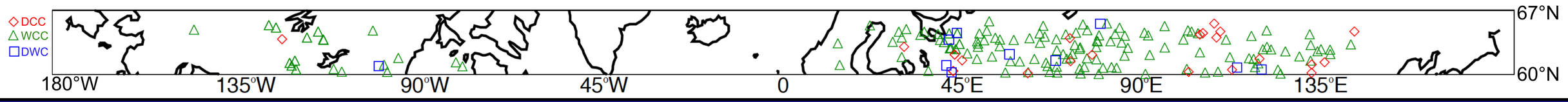
Extreme Convection at High Latitudes as Seen by GPM DPR

Robert Houze[1,2], Stacy Brodzik[1], Jingyu Wang[2], Jiwen Fan[2]

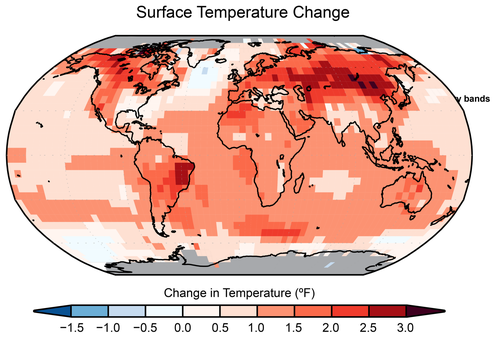
[1]University of Washington, [2]Pacific Northwest National Laboratory

Extreme Convective Events (2014-2017)



Background

- GPM shows extreme convective events at high latitudes when temperatures are high.
- IPCC shows global warming is greatest at high latitudes
- Does this imply more extreme convection at high latitudes in the future?



USGCRP, 2017: Climate Science Special Report: Fourth National Climate Assessment. doi: 10.7930/J0J964J6.

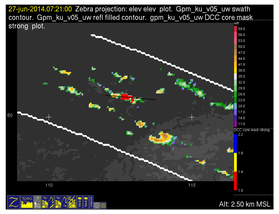
Objectives

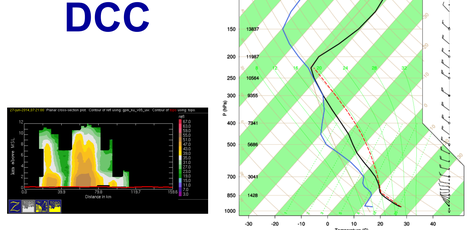
- Show that deep, intense, and wide convective systems occur at very high latitudes, where global warming is most pronounced
- Illustrate the characteristic structures of intense convection at high latitudes
- Determine the temperature, wind and moisture conditions associated with deep, intense, and wide convective systems at high latitudes

Extreme Convective Events seen by GPM DPR at High Latitudes

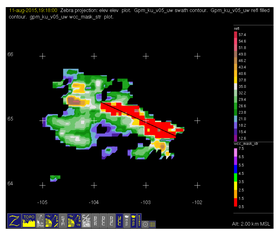
Definitions of extreme convective events
- **DCC→Deep conv. core—3D echo >40dBZ & ≥10 km**
- **WCC→Wide conv. core—3D echo >40dBZ & ≥ 1000 km²**
- **DWC→Deep wide core—3D echo object both deep & wide**

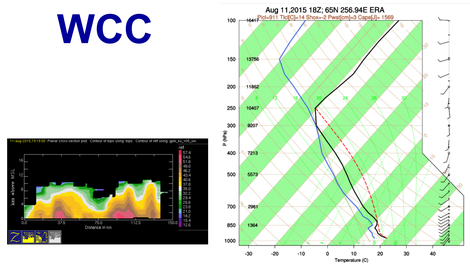
DCC



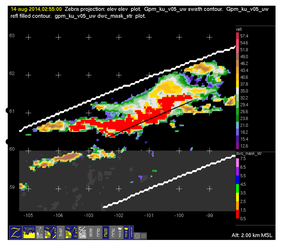


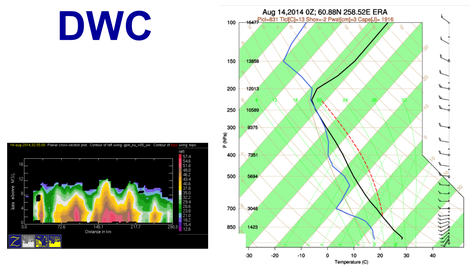
WCC



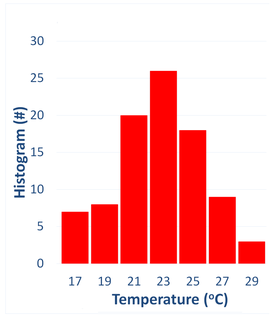


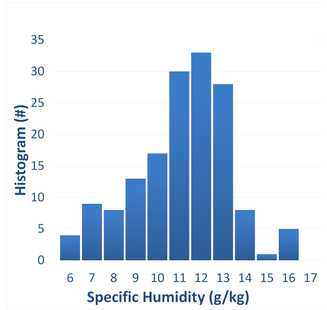
DWC

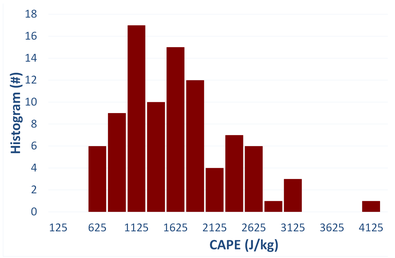


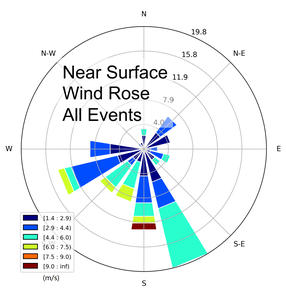


Discussion of Soundings









- Surface T in the 20's (°C)
- Specific Humidity often over 10 g/kg
- CAPE mostly 1000-2500 J/kg
- Surface winds mostly southerly

Summary

- GPM shows that extreme convection (DCCs, WCCs, DWCs) occur frequently at latitudes north of 60°
- Extreme convection occurs when it is very warm at high latitudes
- Global warming at these latitudes suggests high latitude extreme convection will increase
- The synoptic conditions favoring these events need to be studied

Acknowledgments

PMM Grant NNX16AD75G